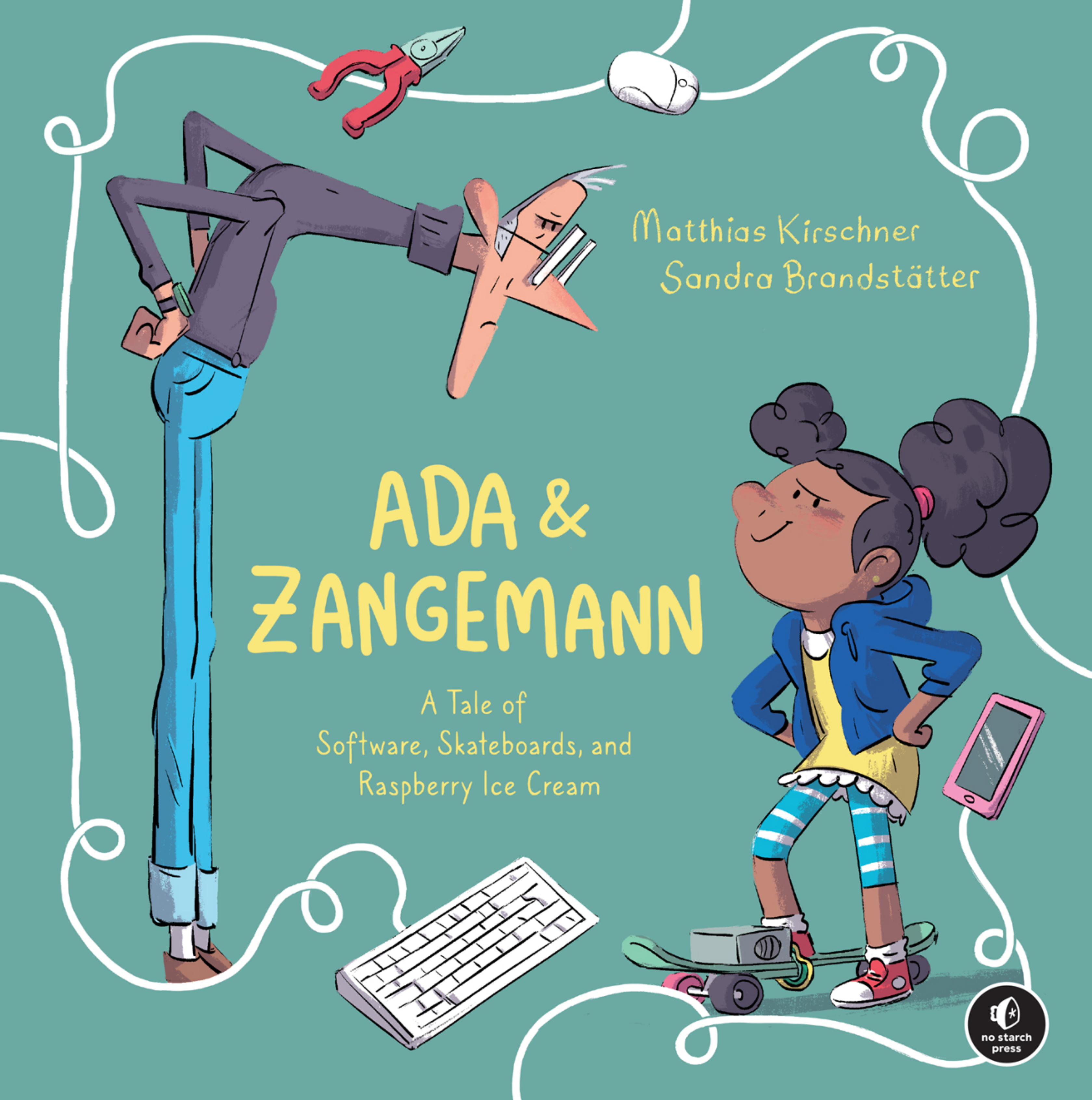

Matthias Kirschner
Sandra Brandstätter

ADA & ZANGEMANN

A Tale of Software, Skateboards, and Raspberry Ice Cream

no starch press

ADA & ZANGEMANN

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Matthias Kirschner Sandra Brandstätter

ADA & ZANGEMANN

A Tale of
Software, Skateboards, and
Raspberry Ice Cream

Once upon a time, there was a little girl named Ada. Her family was so poor that all their savings fit inside a cookie jar. They didn't have enough money to live in a proper home. Instead, Ada lived with her mother and her little brother, Alan, in a hut near a junkyard on the edge of town.

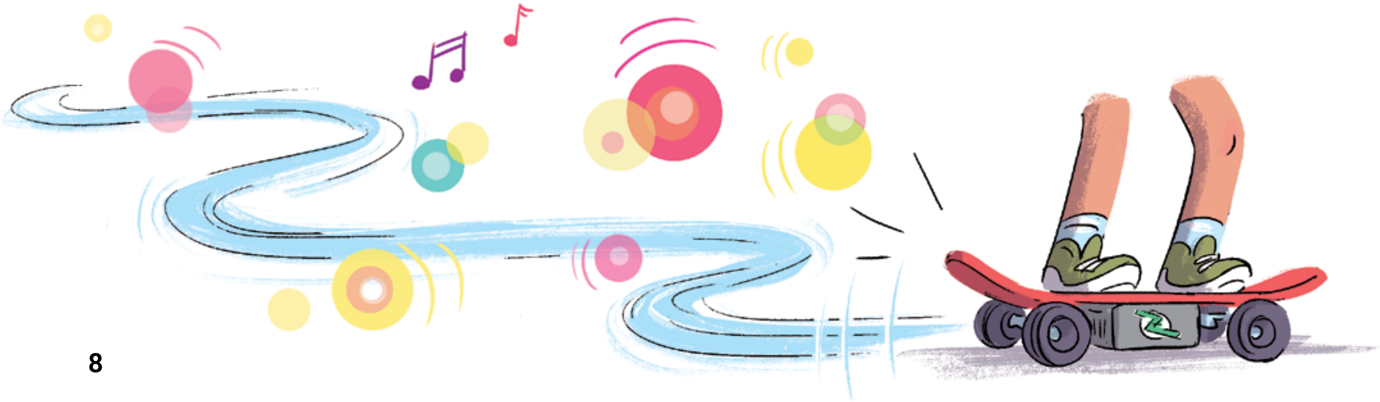
Far away, at the other end of town, lived a famous inventor named Zangemann. He was immensely rich. No sheet of paper in the world was big enough to show his bank balance with all its numbers and zeros! He lived in a huge house with a swimming pool and waterslide, lots of staircases and towers, hundreds of windows, and so many rooms that he often got lost in them himself. Zangemann's mansion stood high on a hill. From there, he could look out over the whole city.

Computers had fascinated Zangemann ever since he was a child. When he was young, computers were huge machines with lots of cables and loud, noisy fans. At school, little Zangemann often dreamed of all the things he would do with computers if they were just a little bit smaller—small enough that they could be built into other fun things. He knew what he would do. First, he would build a computer into his skateboard so that it would make cool noises when he rode it—maybe a fire engine siren or the sound of a rocket launch. Then he would use a computer to invent ice-cream-making machines! The computer would mix the coolest flavors and even sell the ice cream. There would be machines on every street corner, and he could get ice cream in his favorite flavor whenever he felt like it, and just as much as he wanted. After that, he'd build a cleaning robot and a block-sorting machine so that his room would always be neat and clean. Zangemann had great new ideas like these every day. He could think of nothing else.

As the years went by, Zangemann grew bigger and computers got smaller. In fact, by the time he finished school, they were so small they fit in his pocket. The smallest ones even fit on his fingertip.

“Finally, I can turn all my ideas into real things!” Zangemann exclaimed, and he got right to work. He found ways to put the small computers into all kinds of things to make them even more fun and useful. And then he sold them.

Adults and children loved his inventions. All the kids wanted to have one of his skateboards—complete with the latest sounds to show off to their friends at school. Kids also loved his speaker invention, which could instantly play any song you requested. And, of course, everyone loved the ice cream served every afternoon from the automatic, extra-delicious Original Zangemann Ice Cream Machine. It all seemed like magic, but the secret was simple: the little computers that Zangemann built into his machines made it all possible.



These inventions were very popular at Ada's school, and many of her friends rode around on the cool skateboards. Ada was often sad, since her mother couldn't buy her any of those great things: no skateboard, no speakers, no ice cream.

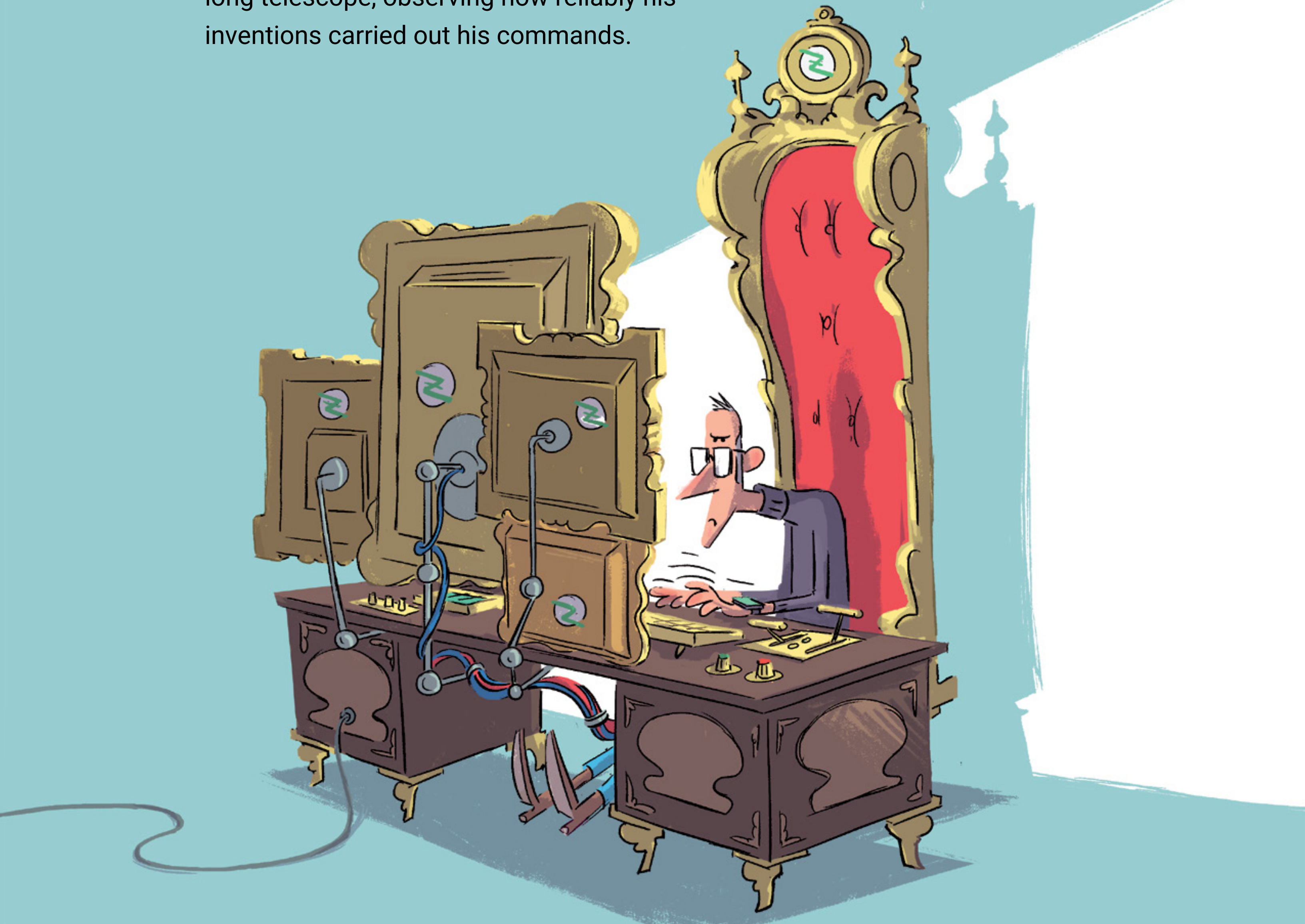
Luckily, Ada lived right next to the junkyard. There were lots of broken gadgets and rusty parts, which she put together to make cool new things, like a soapbox she and Alan rode roaring down the hill, a windmill, and scary junk monsters, which she and Alan would fight together. She also found many useful items—an old cell phone, for example. The screen was cracked, but she could fix that, and while there wasn't internet at the junkyard, she could get access somewhere else.

Ada had so much fun tinkering in the junkyard and fixing broken things that she forgot all about the skateboards and the ice cream.

Because everyone bought his inventions, Zangemann soon became the richest person in the whole world. With all his money, he bought a huge golden computer with a keyboard made of jewels and set it up in the largest room of his mansion. From there, over the internet, he could control all the little computers built into his inventions.

All he had to do was press the proper key on the golden computer, and immediately all the ice-cream machines in town would dispense only vanilla ice cream. If Zangemann wanted people to eat chocolate ice cream, he pressed the key for chocolate ice cream. If he gave the order for lemon ice cream, the machines made only lemon ice cream. Zangemann loved his inventions and was always thrilled at how amazingly well his machines worked. Sometimes people were disappointed when their favorite flavor wasn't available, but what could they do? After all, there was ice cream on every street corner.

Zangemann had a lot of fun pressing the sparkling keys and watching people eat ice cream. He spent many hours every day in front of his golden computer doing this. Again and again, he looked down on the city through a long telescope, observing how reliably his inventions carried out his commands.



When he wasn't sitting at his golden computer, Zangemann was building his little computers into new devices and then selling those. He built washing machines that sent a message to your cell phone when your laundry was done. He made vacuums that played happy music instead of droning loudly. He invented light bulbs that turned on and off at the snap of a finger and cars that told you where the nearest grocery store was.

Soon, almost every appliance in the world had a Zangemann computer built into it. Not all of his inventions seemed necessary at first, but people bought everything he made. That's just the way it was. Everyone wanted the devices made by Zangemann, the greatest inventor in the world.

One day Zangemann thought, “Today I want to see my inventions up close.” He put away his big telescope, then climbed down the many stairs of his mansion and ventured out into the city, full of anticipation at the thought of enjoying his cool devices.

“Maybe a little trip might even give me a few new ideas. If I’m completely honest, my last inventions weren’t quite as useful as the first ones . . . ,” Zangemann pondered. “But my ice-cream machines are and will remain second to none,” he thought immediately afterward, and not without pride, as he passed a group of people all eating coconut ice cream, the flavor of the day.

He was completely absorbed in his thoughts when suddenly—BAM!—something crashed into his shin.

Zangemann yelped and looked around for the cause. A startled child stood in front of him, holding an original Zangemann skateboard under his arm. “Sorry, I didn’t mean to do that,” the child stammered, but Zangemann wasn’t listening.

An angry Zangemann limped away. Suddenly, he heard loud music. He had never before heard something so horrible. He looked around and saw that the music was coming from a loudspeaker he himself had constructed. A child across the street was holding it. The child seemed to like the music, but it gave Zangemann a terrible headache, and his mood worsened. This was not how he had imagined his walk!

Zangemann was so furious with the two children. How dare they use his inventions this way? That night, he couldn't sleep, so he sat down at his golden computer. From there, he gave all the little computers in the skateboards a command that they were no longer allowed to go on sidewalks. He ordered the small computers in the speakers to play music only at a low volume, except for his favorite music, which he immediately turned on to get into a better mood.

The next day, there was a big commotion at Ada’s school. On the way to school, the kids’ skateboards had stopped working. The wheels simply stood still. And the children could no longer turn up the volume on their speakers. What was going on?

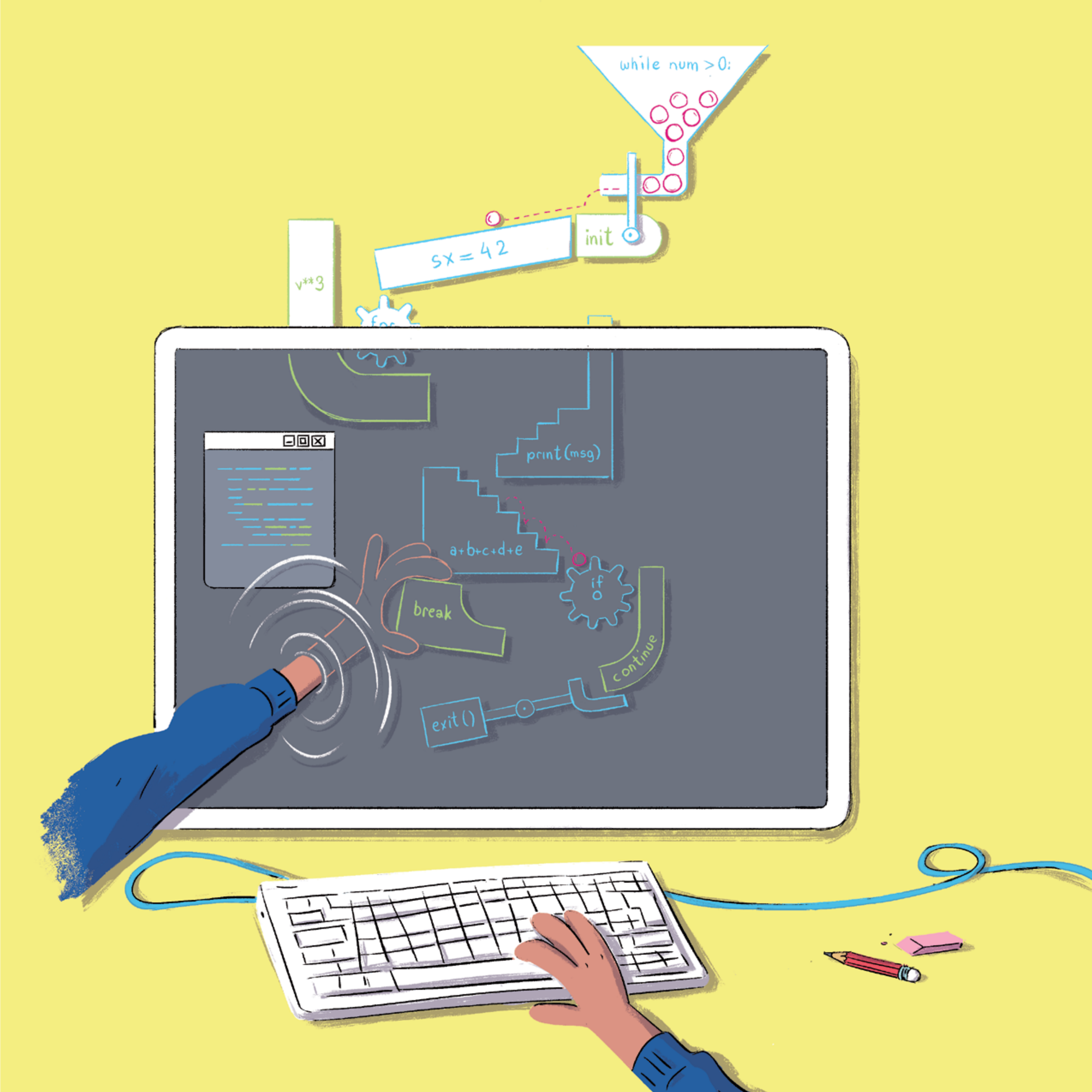
Although she didn't own any of these things, Ada wondered why the skateboards and the speakers suddenly stopped working. But she didn't really have time to think much about it, because she was tinkering again. She put together a complete bicycle from the parts of three broken bicycles. She gave the bicycle to her mother as a present so that she wouldn't have to spend her money on bus tickets to work. For her brother, Ada built a loudspeaker so he could fall asleep to nice stories in the evenings when their mother was still at work.

After a few days, the initial shock at Ada's school was forgotten. The skateboards still didn't go on the sidewalk, but apart from that, they still worked. And so now the children rode in circles around the playground and listened to soft music. Only a strange, pompous marching music continued to play at an unchanged volume, which the children found rather puzzling.

Ada loved Wednesdays. Every Wednesday, her mother and Alan would pick her up from school, and they would all go to the library together. Ada was always drawn to the technology section. There were books with blueprints, instructions for experiments, and explanations of how different devices worked. In the library, Ada could also go online with her cell phone. She quickly realized that there was also much to discover on the internet. There, many people shared their ideas and repair tips to help others.

On one of those afternoons, Ada learned two new words: hardware and software. Hardware was a word for something Ada already knew: the electronic devices she tinkered with after school, or those devices she could hold in her hands and try to fix or make into something else. What was completely new to Ada was the word software. She soon learned that it meant instructions that ran on a computer to control other devices or computers. Some books called those instructions programs or code. With such a computer program, one could, for example, tell a loudspeaker which song to play and how loud.

The best thing about Ada's new discovery was realizing that she could tinker with software just as she could with hardware. Hardware is built with tools—hammers, drills, and screws. Software is built simply by writing down the commands for the hardware, one after the other. There was a separate language for this—the programming language. With software, Ada could make her inventions even more useful. She really wanted to learn the programming language!


while num > 0:
init
sx = 42
v**3
for
print(msg)
a+b+c+d+e
if
break
continue
exit()

Over the next few weeks, Ada spent her afternoons in the library. She found books and websites that explained how programming languages and code worked. For Ada, it felt a bit like learning a secret language, or like studying vocabulary in school. Ada ate it all up. She expected her first program to do something simple: “Make this lamp blink!”

Of course, she wanted to try her program out right away to see if it really worked. At the junkyard, she connected her cell phone to a small LED lamp. Then she typed the lines of code into her cell phone.

At first, nothing happened. Ada wondered where the error could be. She made a few small changes and tried again and . . . “Yeesss!” The little light began to flash. On, off, on, off. Ada looked at the LED in amazement. She had written her first program!

Ada was totally thrilled. She imagined all the great things she could do. If she just entered the right code, she could make her inventions do exactly what she wanted. It was not so easy, but after a few weeks, Ada wrote a truly useful program: one that would make Alan’s speakers automatically turn off half an hour after he had fallen asleep.

Ada also had an idea for the next program she would write. It was a bigger deal, a real project. She would probably need the whole summer break for it . . . And she could hardly wait!

Zangemann had slept horribly every night since his terrible walk in the city. When he went to bed each night, worries plagued him. “Oh no, my marvelous inventions. It can’t be that everyone just plays around with them. All the things that could go wrong! I put so much thought into everything, down to the last detail.” Zangemann pondered and pondered and tossed and turned sleeplessly in his bed all night.

Waking up one morning with a deeply furrowed brow, he made a decision. He needed to make a change. Zangemann sat down at his computer and wrote one program after another. In these programs, he specified exactly what his inventions were to do and were not to do under any circumstances. The chaos had to stop!

Once he was done, he sent all the new programs from his golden computer to people’s devices. He ordered his speakers to play only his favorite music whenever he was within earshot. He programmed the ice-cream machines to stop selling ice cream in the afternoon. After all, he didn’t want his expensive clothes to get stained by ice cream while he was out for a walk. All day long he sat at the computer and typed and typed and typed . . .

Summer break was already halfway over. Ada stood in front of her big project and scratched her head. She had built a skateboard from old parts and then connected a motor to make the wheels turn. With a motorized skateboard, Ada could zoom to the library or the junkyard even faster after school. Super practical! But it didn’t work. When she stood on it and pressed the Go! button, the wheels moved, but way too fast. Ada fell off the skateboard every time she started. No matter what she tried, she just couldn’t get it right.

After falling on her bottom for the hundredth time, she went back to the library. She always found answers to her questions there. And indeed, on the internet, she came across a program that someone had written for an electric scooter that also needed to start slowly. Ada downloaded it to her phone.

Back at the junkyard, she adapted some lines of code for her skateboard program. She tweaked a few things and kept tinkering.

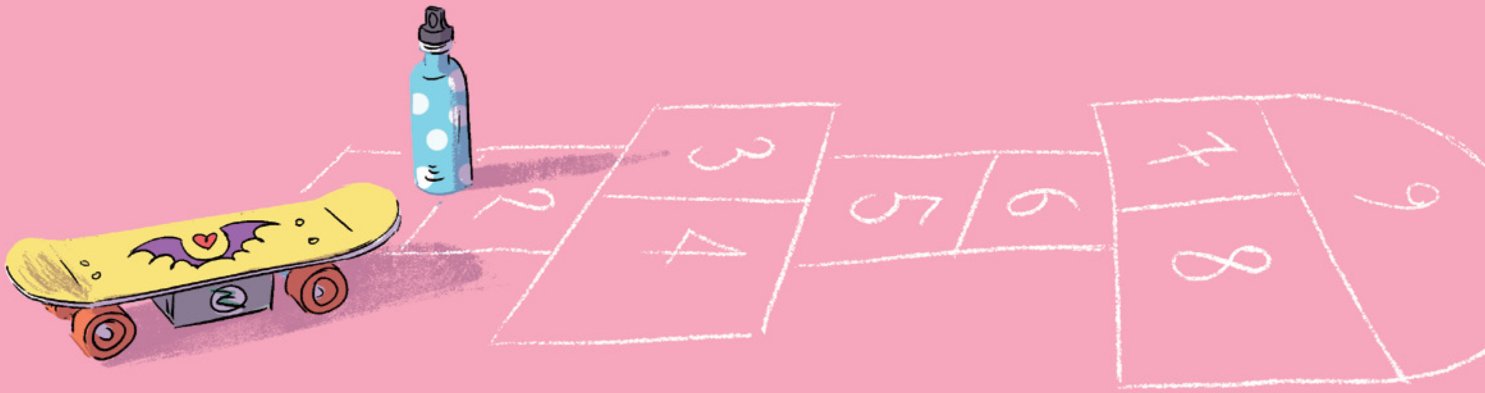
Several failed attempts later, on the last day of summer break, the time had finally come. Ada stood on the skateboard and pressed the Go! button, and the skateboard started moving, slowly at first, then faster. It worked! She tried to brake. It worked! Ada let out a cry of joy and took a trip to the park.

When Ada rode her skateboard to school on the first day back after summer break, the other children were amazed. During recess, Ada's curious classmates surrounded her.

"How can you ride your skateboard on the sidewalk?" they asked.

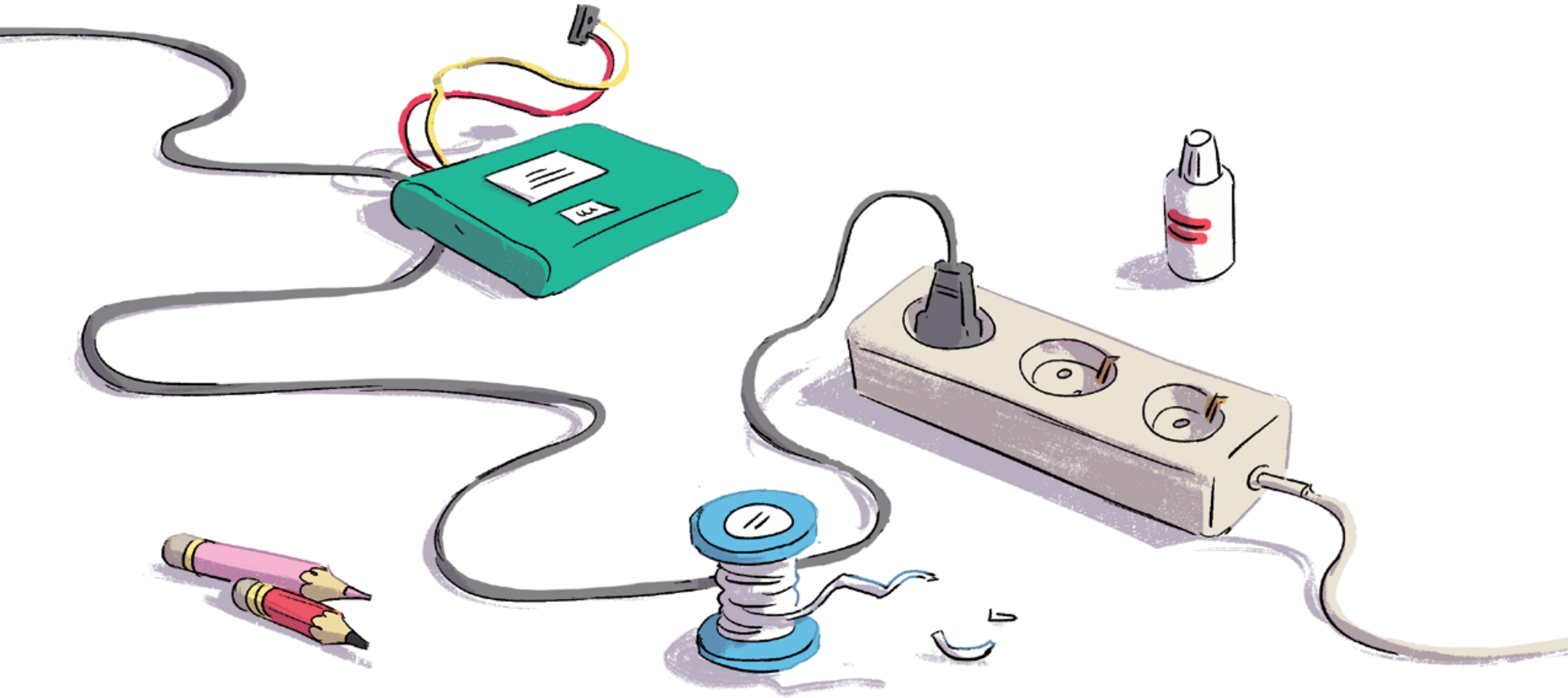
Ada thought for a moment, then said, “I don’t think it’s your skateboards but actually the software in them. It’s probably programmed into the software that the skateboards aren’t allowed to go on the sidewalk. But that can be changed!”

That evening, Ada tested out her theory on her classmate Toni’s skateboard. She worked secretly through most of the night, and the next day, Toni could ride on the sidewalk again. Unfortunately, his skateboard could no longer make the sounds that his parents had bought from Zangemann. Instead, every 10 minutes it made a strange noise that sounded like a drawn-out burp. Ada knew that little errors like that could pop up in programs all the time. But Toni’s burping skateboard was really quite funny.



More and more children started to visit Ada at the junkyard after school, and she helped them rewrite the programs in their skateboards. Some of her classmates were very excited about this new discovery. It was unbelievable what you could do with software code! They wanted to learn everything Ada knew about programming languages, and soon they were riding their skateboards again, wherever they wanted to.

But that wasn't all. With the software, they could give their skateboards new, cool features. Marie attached colorful LED lights to her board that glowed different colors depending on the speed. Konrad built old propellers onto his skateboard for extra speed.

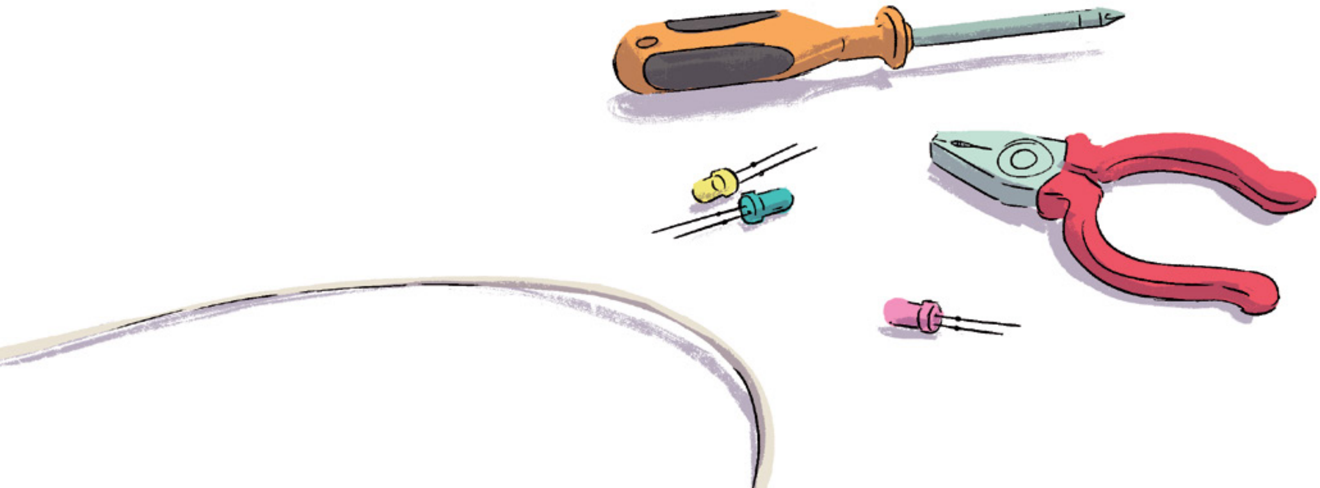


Ada, Toni, Marie, and Konrad spent many afternoons at the junkyard. They even set up a real workshop where they could fine-tune their programs for hours, listening all the while to music from the speakers Ada had built for Alan.

“Your brother’s speakers are much louder than ours,” remarked Toni, who was busy attaching a speedometer to his helmet.

“I’m sure that’s also because of the software,” Marie said.

Together, they changed the software for the speakers too. Then they turned up the music as loud as possible and danced wildly together.



BURP

Every day, Ada and her friends made plans together for the afternoon. From a broken ice-cream machine, they built a new one that could make ice cream in every imaginable shape and color. They ate square ice cream, heart-shaped ice cream, and even pyramid-shaped ice cream, as well as strawberry, raspberry, and rainbow ice cream, all with sprinkles and hot fudge—much better than the varieties from the Zangemann machines.

Sometimes they could even help adults. Toni reprogrammed his father's ironing machine so that it could also iron ties again—Zangemann had forbidden the machines to do so because he hated ties like the plague. For the bus driver, they built an automatic watering system out of old hoses and a computer so that her plants would not die of thirst during summer days. And they helped the school custodian modify his vacuum so that it automatically recognized toys and wouldn't suck them up.

Some things they built just for fun, like the fart machine they put in their math teacher's chair. Whenever Ms. Gernet sat down, the machine played a little fart sound. The teacher would scold them, but Ada was sure that she secretly smirked a little every time.

One day, Zangemann noticed that some computers no longer obeyed his programming commands. Shocked and fuming with anger, he called the president. In a quivering voice, Zangemann yelled, “Someone is rewriting the programs in my devices. That can’t happen; after all, they are my inventions. It’s far too dangerous if everyone can do whatever they want with the computers. You must make a law against this!”

The president did not want to upset Zangemann. All the government’s computers were programmed by Zangemann. Without the computers, the government would not be able to run the country. So they passed the law as Zangemann requested:

“All computers that do not listen to Zangemann are banned. Anyone who reprograms Zangemann’s devices will be fined 500,000 gold pieces!”

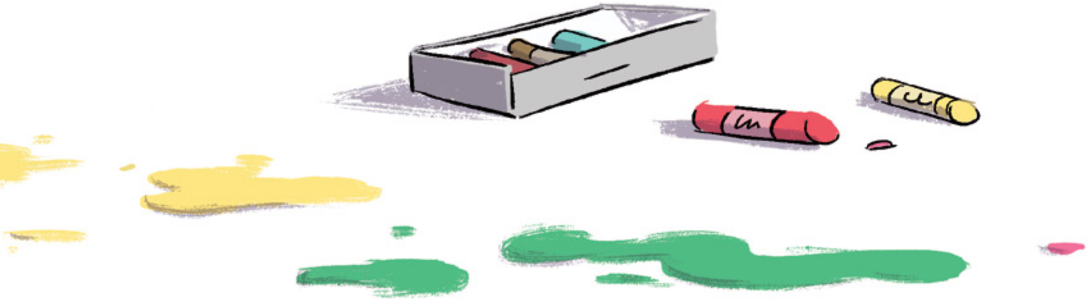
When Ada and her friends heard this, they were furious. “This is unfair,” they said. “We rebuilt and reprogrammed our skateboards ourselves. They are much better now. We won’t let anyone take that away from us!”

They gathered in front of one of their rebuilt ice-cream machines and discussed the situation. It was clear that something had to be done about the new law, and they made a plan . . .

The next day, they didn't go to school. Instead, they rode their skateboards to the parliament building, with large protest signs under their arms, and sat down in front of the building. The evening before, they had put LED lights on some of the signs, which were now flashing brightly. They had connected their speakers together so everyone in the street could hear what they were saying. Some passersby stopped and asked the children what they were demonstrating for.

“For software freedom!” they replied in unison and told the adults their story. Impressed, the adults nodded, and the president also looked curiously at their signs as he approached the building.

On the following day, Ada and her friends again sat down in front of the parliament building, this time with support. Some classmates came whose skateboards Ada had reprogrammed. Toni's father and other parents and adults also wanted to support the protest. They found the children's devices very useful.



With each passing day, more and more children and adults joined the protest. The bus driver they had helped drove up in her bus. She honked loudly to attract even more people to the protest. The custodian brought a few friends, and Toni's father brought his colleagues from work, all wearing perfectly ironed ties. Even Ms. Gernet came. The crowd grew, and after a few weeks, there were protests not just in Ada's city but also in many cities throughout the country.

Hacking 4 FREEDOM
THERE IS A CODE 8
They are young + need the code!
DON'T WRECK OUR TECH!

Ada protested in front of the parliament building every week, even in pouring rain. On one such rainy day, when the president passed the group of dripping-wet children, he couldn't help but admire their stubbornness. He asked Ada, "Why do you sit here every day? What do you want to achieve?" Ada replied, "We want to determine for ourselves what we can and cannot do with our computers." Her friends shouted in unison: "Don't wreck our tech! Don't wreck our tech!" and "We want the code! We want the code!"

The president looked at the determined faces of the children. Honestly, he, too, wanted to decide for himself what the government could and couldn't do with its computers. But he didn't understand anything about computers and code, so he had always left that to Zangemann. Deep in thought, the president entered the building.

The next day, the president invited Ada and her friends over. "We also want to be in charge of our software ourselves. In order for that to be true, the government must be independent from Zangemann. Can you tell me what you know about computer programs?" he asked them. Enthusiastically, they explained to him how software works and what you could do with it. The president was amazed.

With this new knowledge, the government would be able to design its own software, the way it wanted—completely without Zangemann. Immediately, the president called his advisers. In a large group, they discussed with the children everything they could change and improve in the software.

That evening, the children went home proud and satisfied. Something finally happened! Their long protest was worth it.

The next morning, the president's phone rang very early. It was Zangemann. He was angrier than ever. "Without me, the government computers will no longer work," he threatened. But the president kept the call short and quickly hung up. The phone rang many more times that day, but Zangemann's calls went unanswered. The president sat in a meeting with Ada, Toni, Marie, Konrad, and the government experts.

In the days that followed, they talked from morning to night and designed their first programs for the government's computers. They were no longer disturbed by Zangemann's calls. Toni had the good idea of reprogramming the telephones. When Zangemann called, he only heard an automated recording: "The government only wants to use software that it can freely use, study, share, and improve. Thank you for calling."

Then, after many weeks of protests and discussions, the time had finally come: they abolished the old Zangemann law! Instead, the government announced:

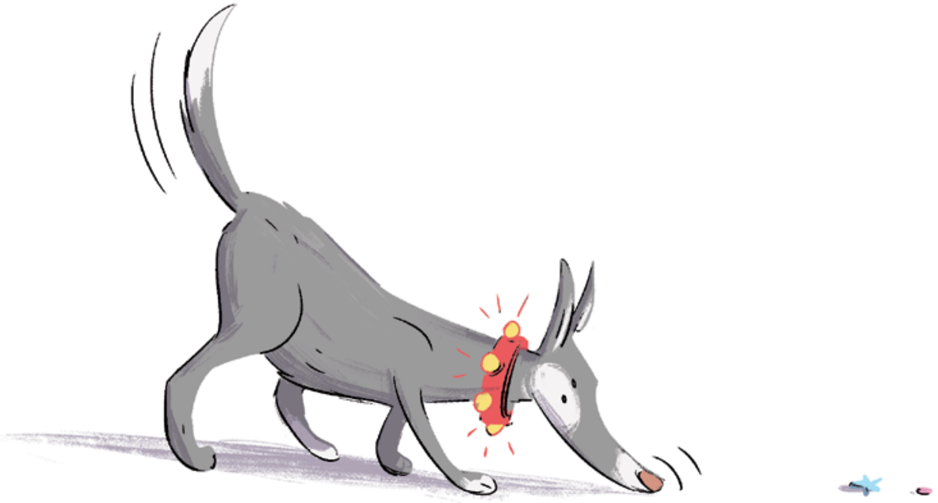
“Everyone is allowed to program their own computers as long as they adhere to the other laws.”

In addition, a new school subject was introduced: computer hardware and software.

That evening, everyone celebrated with a big party. Ada, Alan, Toni, Marie, Konrad, and other children from school and their parents; the president; Ms. Gernet; the bus driver; the custodian—they were all there. They decorated the streets, listened to loud music, and ate ice cream, as much as they wanted, and in every imaginable shape and color.

While the others continued partying late into the night, Ada and her friends slipped away to their workshop. They already had a lot of ideas for new inventions. And they wanted to start right away.

And Zangemann? No one's heard much from him. Maybe he's still sitting angrily in front of his golden computer. Maybe he doesn't dare go out into the street anymore and has boarded up all the windows of his mansion so that he doesn't have to worry about what other people are doing with his inventions. But maybe he also sometimes looks out into the world through his telescope and sees what the children are inventing every day. Perhaps then he will remember how much fun it was for himself to tinker and experiment. And maybe, just maybe, he eats pyramid-shaped raspberry ice cream with rainbow sprinkles.



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AUTHOR
MATTHIAS KIRSCHNER

Matthias was fascinated by computers and software as a child. He had an internet connection early, through which he learned a lot. Children have a right to take their future into their own hands. Therefore, Matthias is committed to the goal that all humans can use software in a self-determined way. He also wants to build an electric skateboard with Free Software.

ILLUSTRATOR
SANDRA BRANDSTÄTTER

Sandra has always liked crafting with scissors, pliers, glue, wire, fabric, and paper. Today she works as an illustrator, comic author, and character designer for animated films and series, such as the German public television series *Trudes Tier*. On an ice-cream machine, Sandra would pick a creamy rainbow ice cream with lemon flavor and a lot of sprinkles.

WEBSITE FOR THE BOOK

The Free Software Foundation Europe e.V. is a nonprofit association that empowers people to control technology. Software affects all areas of our life. That is why it is important that this technology gives us freedom instead of restricting us. Free Software (also called Open Source) gives everyone the right to use, study, share, and improve programs. Therefore, Free Software strengthens basic rights such as freedom of expression, freedom of the press, and the right to privacy.

On the web page of the book, you will find more information and resources: https://ada.fsfe.org.

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Come up with some delicious, funny, or crazy ice-cream flavors and draw them on the ice-cream cones on the following page. More coloring templates and information about the book can be found at https://ada.fsfe.org.

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—Vint Cerf, Computer Scientist and One of the Inventors of the Internet

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